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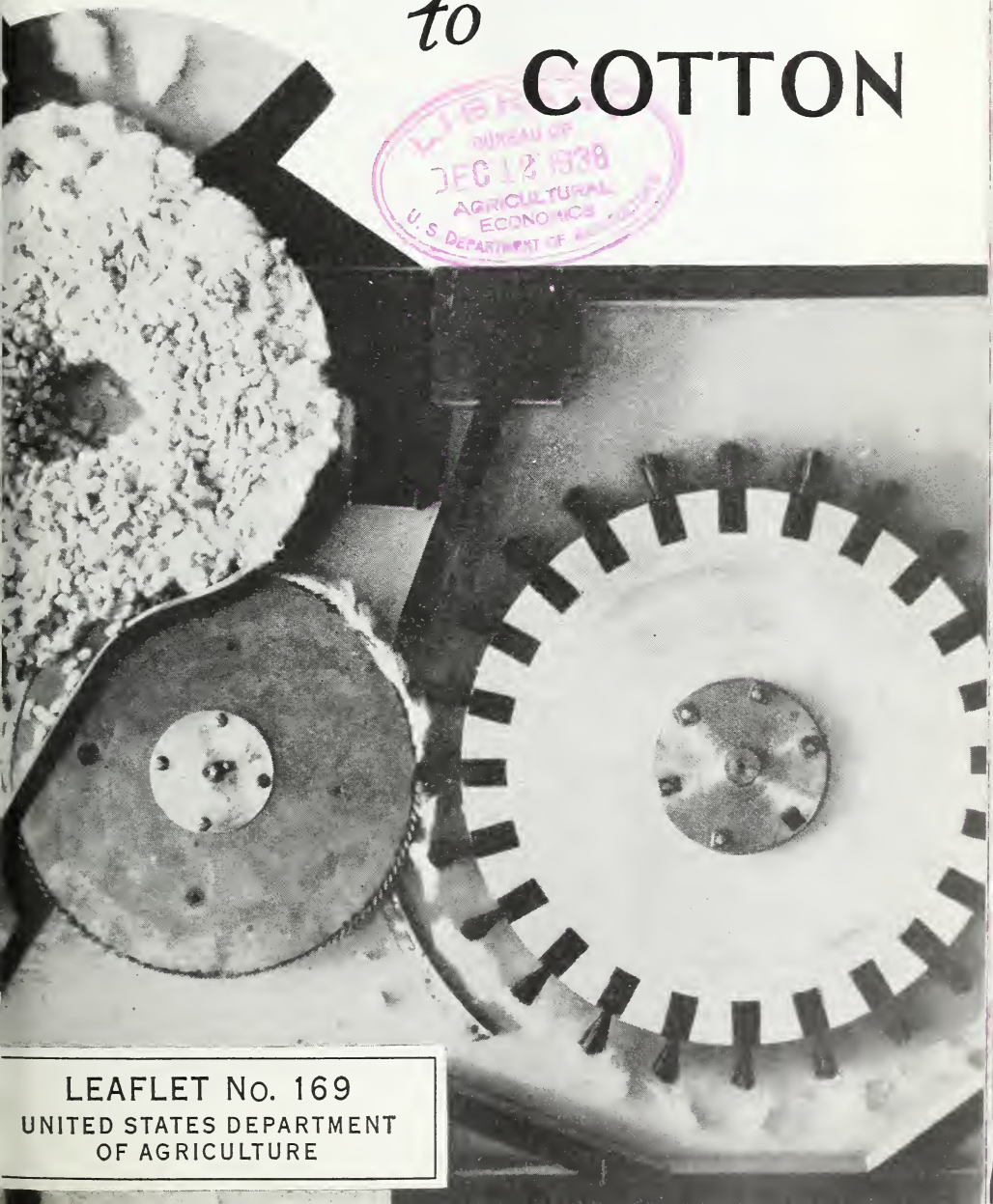

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PREVENTING GIN DAMAGE TO COTTON

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Gin damage to lint cotton is characterized principally by the presence of naps—rather large, more or less tightly matted masses of fiber—in the sample. These naps lower the grade of the ginned lint and reduce its value. Gin damage is easily detected in the sample and is one of the chief quality defects that buyers complain about. Progressive buyers generally call it to the attention of the grower, who, because he suffers a loss in price, complains to the ginner. Thus the responsibility is usually placed upon the ginner to try to trace the damage to its source.

Ginners generally know that the fault lies either in the cotton or in the gin machinery. An increasing number of requests from ginners for advice and assistance have been received by the United States Cotton Ginning Laboratories and other agencies. Usually poorly ginned or damaged samples are submitted with these requests. A hasty examination of the samples does not reveal the underlying faults in the cotton or in the machinery and its operation. Further observations, coupled with tests made by the ginner himself, are usually necessary to get at the root of the difficulty.

Gin Damage, or Poor Ginning Preparation

Damage to cotton in ginning is caused by what the trade calls poor ginning preparation. Preparation, one of the three elements considered in determining grade, is determined by such factors as nappiness, neppiness, stringiness, roughness, and motiness. Figure 1 shows a smooth-preparation sample, (*A*), in contrast with a rough-preparation one, (*B*). The differences in fiber qualities of these two samples are clearly brought out in the two thinner masses of lint removed from other portions of these two samples shown as *C* and *D*. If a sample of cotton otherwise equivalent to that of a particular grade is rougher than normal for that grade, it may be classified one full grade or more lower than if the ginning preparation were normal, depending on the extent of damage. The penalties per bale have been known to range from $1 to $10, or more, depending on the grade and staple of the cotton and the nature and extent of the damage.

Condition of Seed Cotton Important

When a ginner notices poor ginning preparation, he should first find out whether the damage is traceable to excess moisture in the seed cotton. If operating practices remain the same and bales of rough cotton occur only intermittently, the damage is likely to be the result of dampness in the cotton. If the cotton is long-staple, even a slight excess of moisture will cause roughness in the sample, because the longer the staple, the greater the gin damage if the cotton is moist.

More cotton shows rough preparation during the early part of the season, when cotton is harvested in a more or less green and damp condition, and at times when there are rains or heavy dews. In damp seed cotton (whether the dampness is due to sap moisture in freshly

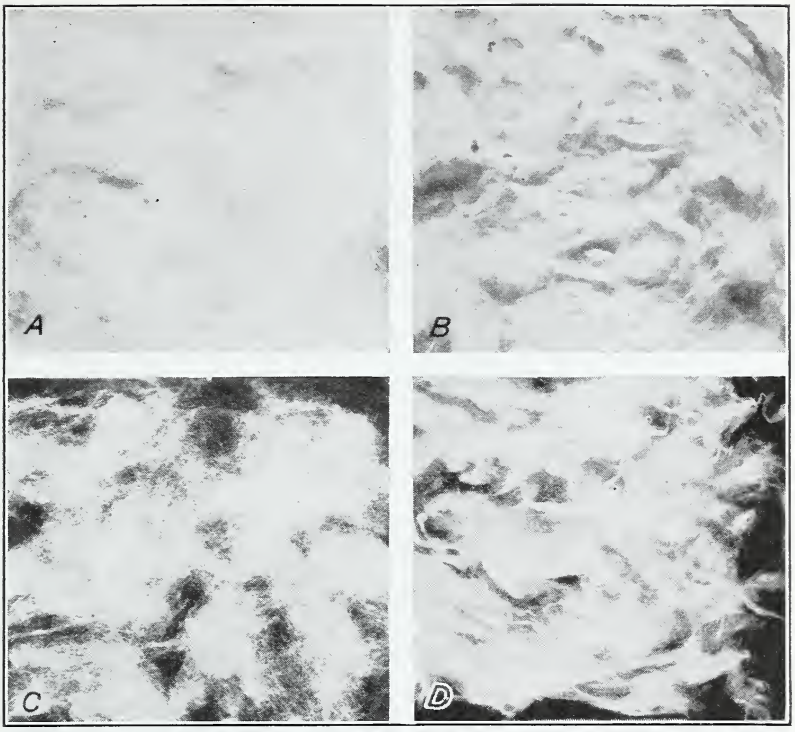

FIGURE 1.—Bulk cotton ginned (*A*) smoothly; and (*B*) roughly (gin-damaged). Thin layers of smoothly ginned cotton, without naps, (*C*); and gin-damaged cotton, showing many naps, (*D*).

opened bolls or to rain or dew) the seeds are likely to chip during ginning. The small fragments of seed coat with tufts of fibers still attached to them are illustrated in figure 2. They usually lower the spinning value of the lint cotton because they are difficult to remove and because any fragments that are not removed may cause imperfections in the yarn [1] (fig. 2, *B*).

The use of mechanical cotton driers will largely overcome the difficulties of ginning damp cotton and will improve the quality and increase the value of the ginned lint. Mechanical driers are on the market and are available in home-made designs.

Occasionally roughness in the lint may come from immaturity and motiness of the locks, which in turn may be due to droughty weather or to the fact that the cotton opened late in the season. It is usual in the lower grades. Neppiness—very small tangles of fibers—is almost always connected with immaturity of fiber. Motes are extraneous material that should be removed, but they are frequently crushed during the ginning or in preliminary stages of yarn manufacture. These fragments lower the quality of the manufactured products. Figure 3 shows motes removed from seed cotton, motes and their fragments as they occur in the lint, and mote fragments in the yarn.

[1] For a further discussion, see the following publications: PEARSON, NORMA L. NAPS, NEPS, MOTES, and SEED-COAT FRAGMENTS. A DESCRIPTION OF CERTAIN ELEMENTS OF COTTON QUALITY. A PRELIMINARY REPORT. U. S. Bur. Agr. Econ. 1937. [Mimeographed.]

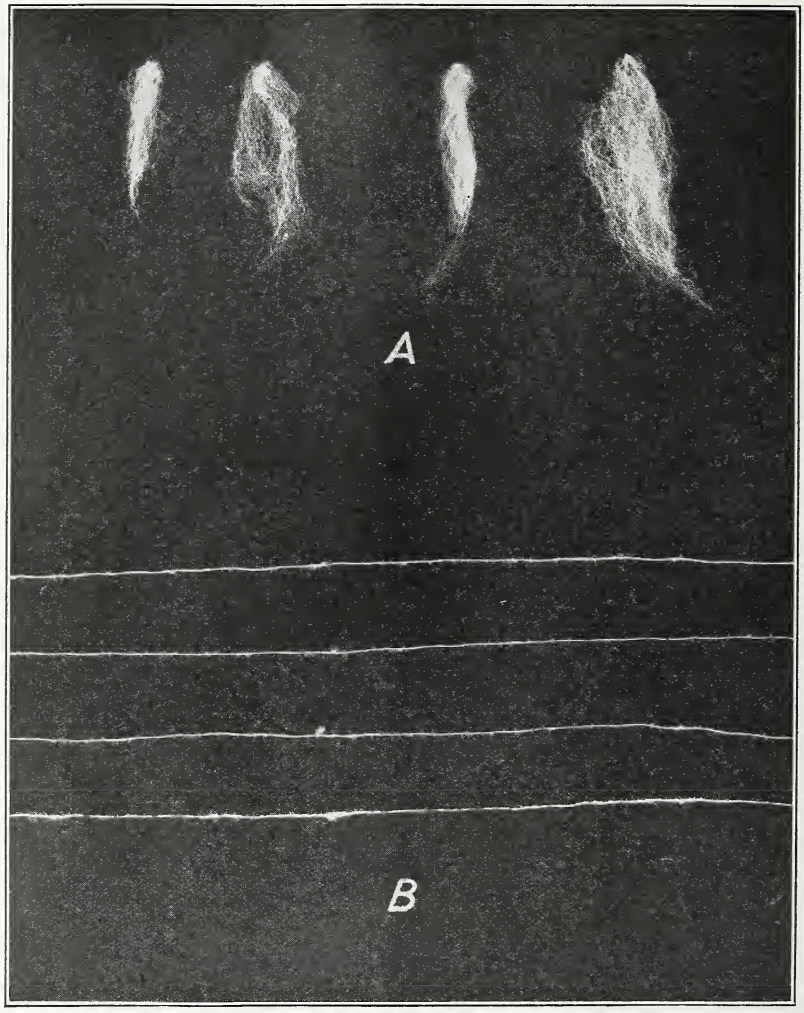

FIGURE 2.—Seed-coat fragments: *A*, Removed from lint; and *B*, occurring in yarn.

Detecting Faulty Ginning

When the damage is not caused entirely by the condition of the seed cotton, the next thing to check is the seed roll of the gin stands. The tighter the seed roll, the greater the damage done to the quality. Using tight rolls instead of loose rolls may lower the price of a bale from 60 cents for short-staple dry cotton, to $4.50 for long-staple damp cotton. Loose seed rolls are whiter in color than the tight seed rolls because they contain more fibrous material per pound of seed. It is easier to make an indentation with the hand in a loose seed roll because of its "softness." This is the method commonly used by ginners, and from experience has been found to be reasonably reliable.

In hunting for the trouble, other items to be checked, in the order of importance, are somewhat as follows: Condition and setting of gin saws, ribs, brushes, or air-blast system; brush speeds and air-blast

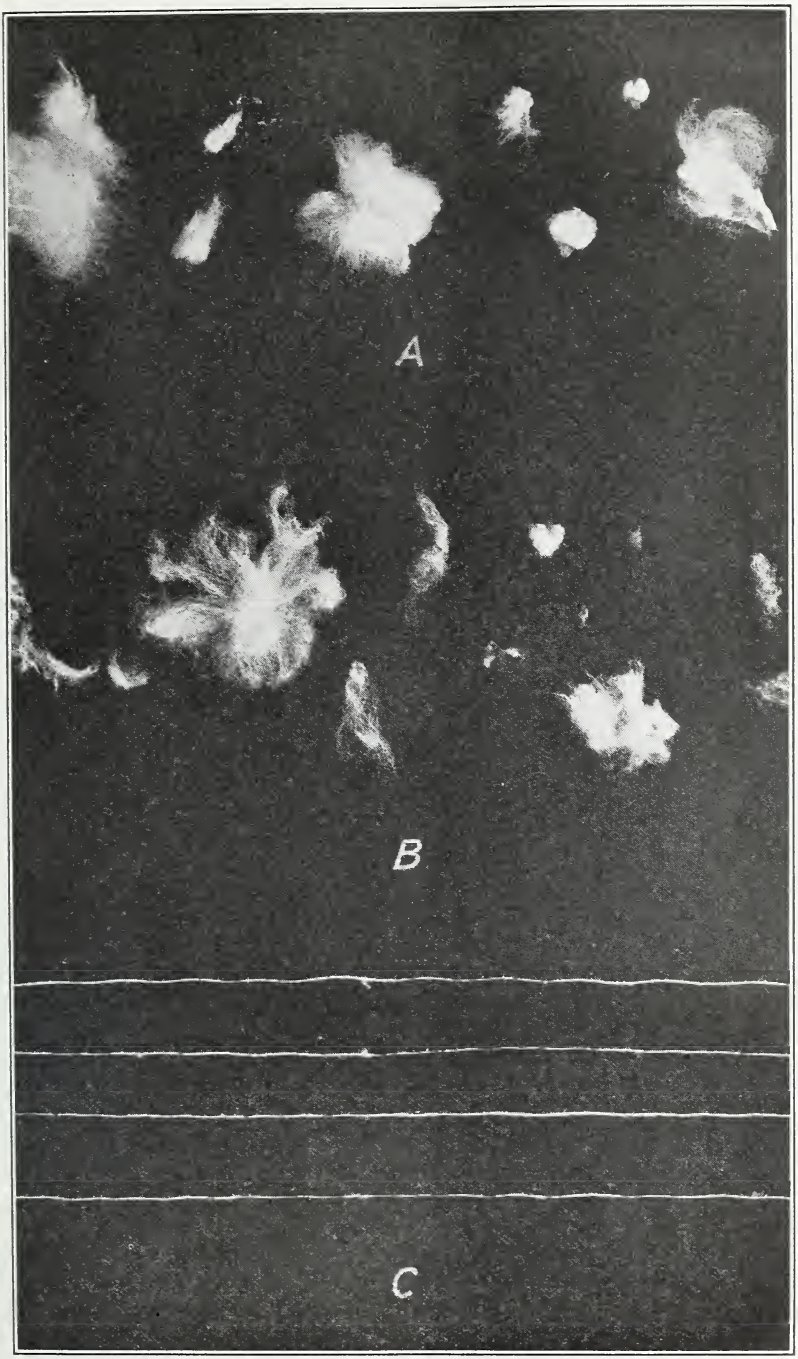

FIGURE 3.—Motes: *A*, Whole motes from seed cotton; *B*, whole motes, crushed motes, and mote fragments from ginned lint; and *C*, mote fragments in yarn.

pressures; speed of gin saws; settings of seed, mote, and dividing boards; speed of feeders; and condition of cleaning and huller devices, lint flue, and condenser.

Checking the Gin Saws

Frequently the condition of gin saws with respect to wear, sharpness, tooth shape, or pitch causes gin damage. They contribute to tight seed rolls and to decreased ginning capacity. Frequent checking over is desirable. In some gins saws are allowed to become so faulty that loose seed rolls cannot be maintained even when the feeder is set to give the slowest feed. Gumming and filing of the saws must retain the factory pitch and roundness as nearly as practicable. To maintain normal ginning capacity and prevent losses in turn-out and damage to the quality of the lint, gin saws should be replaced before they are reduced one-sixteenth of an inch in diameter by wear and sharpening and before they have a noticeable number of broken teeth.[2]

Factory pitch can be checked by using the gages or gin-saw segments furnished by the manufacturers. If neither is available, adjustments should be made so that the leading edge of the saw tooth is made to pass through the ribs parallel with the surface of the ribs or with the points of the teeth very slightly in advance; they should not "drag" the rib. When these precautions are taken, the greatest ginning capacity and lint turn-out can be obtained with loose seed rolls. Roach- or curve-back teeth can be brought to a moderately straight-back shape; this increases the ginning capacity, the lint turn-out, and the value of the lint.

Saw cylinders should be checked to see that they are running at or near the manufacturer's recommended speeds. If saws are rotating slowly, seed rolls will be tighter than at a higher speed with a given rate of feed of cotton to the stands, but excessive speeds are sometimes bad for both cotton and machinery.

Examining the Ribs

Ribs can become so badly worn that seed will readily pass through the rib space or slot along with the lint, causing chockages there and additions of seed to the ginned lint. Most manufacturers can furnish gages for checking the rib spaces. Ribs should have well-defined edges. When examination shows them to be in bad condition, gin ribs should be repaired or replaced. Repairs consist of welding new materials on the worn spots to build up the ribs, followed by grinding to correct dimension and shape; or covering worn surfaces with hardened plates of suitable width and minimum thickness to give well-defined edges to the ribs. Unless repairing can be done with suitable equipment, or by factories, or reputable repair shops, it is better to get new ribs.

Testing the Lint-Doffing System

If the saws and ribs appear to be in good condition, the doffing apparatus should be examined and tested, as it removes the ginned lint from the saws and, if neglected, may bring severe lint damage.

Gin stands of the brush type use brush cylinders the tip speeds of which should be approximately 6,666 linear feet per minute—that is,

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[2] See the following publication: BENNETT, CHARLES A., and GERDES, FRANCIS L. CARE AND MAINTENANCE OF COTTON-GIN SAWS AND RIBS. U. S. Dept. Agr. Cir. 393, 20 pp., illus. 1936.

1,420 revolutions per minute for an 18-inch-diameter brush, 1,600 revolutions for a 16-inch, and 1,700 revolutions for a 15-inch brush. Tests show that no fixed ratio of speeds of brushes and saws is necessary and that reasonable increase or decrease in brush speed from the manufacturer's standard tip speed of 6,666 linear feet per minute does not bring difficulties in ginning.

Doffing is ineffective if the bristles of the brushes are worn or are badly saw-cut. It is ineffective if the brush has been shifted from its correct relationship of full tooth mesh with the saws so that the bristles do not do their work properly. Ineffective doffing causes dense seed rolls and poorly prepared lint, particularly when damp or wet seed cotton is being ginned. Brushes should be put in first-class condition by refilling with new bristles or by replacing with new sticks and by rebalancing the cylinder whenever excessive vibration appears.

In gin stands of the air-blast type, damages to the cotton may come if the necessary nozzle pressure of the air blast is not maintained. Incorrect fan speeds, leaks in air piping, and obstructions in the air-blast nozzles prevent adequate doffing. The partition plates that comprise the strengthening segments within the nozzle may break loose in the older forms of air-blast gins. Often the nozzle orifice becomes distorted at the break, and most of the air is blown through there instead of being evenly distributed. To find out whether this is happening, it is necessary to remove the saw cylinder and watch the nozzle while the air-blast fan is running at full pressure. As the correct position of the nozzle in relation to the saw teeth is essential to good ginning, the use of an air-blast gage is recommended for continual attention to air-blast pressures during operation.

Setting the Seed, Mote, and Dividing Boards

The position of the seed board partly controls the rate of discharge of the ginned seed from the roll box, as well as the density of the seed roll. The board should be set to allow full passage of cleanly ginned seed from the roll box so as to avoid tight seed rolls. These settings depend on the characteristics and conditions of the cotton and upon the rate of feed into the roll box.

Mote-board positions should allow as much discharge of foreign matter and motes as possible without loss of good fiber. Slides of the mote boards should be kept clean to permit adjusting the boards.

In brush gins the dividing board between saw and brush cylinders should be kept to factory size and position by using sheet-metal cover or construction, because this affects the action of the brush in doffing. The backboard, above the brush at the back of the gin stand, must be free from wear, and kept close enough to the brush tips to prevent the accumulation of fly and lint in a wad above the brush.

Timing the Feeder Speeds

If the speed of gin feeders is changed after they are installed, the rate of feed for a given setting is affected. The more the speed is increased, the greater is the rate of feed to the gin stands, and the tighter is the seed roll. Feeders should be timed in order to keep their speed equal to or lower than manufacturer's recommended rates.

Inspecting, Cleaning, and Extracting Devices

Cleaning and exacting units are often open to question in case of lint damage. They include the overhead cleaners and extractors that

some gins have, and the feeders and fronts of the gin stands themselves. Some part may be faulty in operation. Inspection should show up the trouble. Screens in cleaners and feeders must be kept in good repair and set at proper distance from the tips of the cylinders. If the extractors are of the saw or plate type, the teeth should be straightened occasionally. The adjustments of such parts as stripper rollers should be kept to the standard settings of the manufacturer. In huller gins, lint damage may come from improper speed and adjustment of the picker rollers or incorrect setting of the huller ribs.

Examining Lint Flues and Condensers

Sometimes intermittent damage to lint cannot be accounted for until the lint flues and condenser of the ginning system have been examined. Rough surfaces, projecting bolt heads, broken seams, and home-made repairs all help to form roped and tangled masses of lint that occasionally build up and cause puzzling troubles. Daily cleaning of the condenser is extremely important in preserving unobstructed screen areas. This is particularly true of air-blast gins because of the higher air pressures used. The condensers for modern air-blast gins are uniformly larger than for the same number of brush-gin stands, but keeping all types clean is essential to good ginning.

Preserving Other Elements of Grade

In addition to the condition of seed cotton, other properties of cotton may decrease the quality of ginned lint. Haphazard harvesting practices bring penalties in the way of lower grades because of excess leaf. The farmer should be encouraged to harvest his crop carefully even though present-day gin machinery can clean dirty, trashy, and roughly harvested cotton fairly well. Undue exposure of cotton in the field also causes the lint to be leafy, discolored, and weak.

Preventing Irregularities in the Quality of Cotton Bales

To get a uniform bale of good cotton, the farmer must deliver to the ginner a load of seed cotton that is uniform with respect to moisture content, foreign matter, fiber length, color, strength, etc. The ginner, in turn, must take all possible care to use the same ginning practices throughout the ginning of the entire bale. Early-season and late-season cotton, or clean and trashy, or dry and damp, or long and short cotton, or lots of cotton that are unlike in other respects, should not be placed in a wagon to be ginned as one bale. If this is done, the cotton should be thoroughly composited and mixed by hand before it is ginned, for two-sided bales are likely to mean a money loss when the buyer offers a price based on the low-grade side.

The ginner should avoid plating bales of one quality of cotton with lint from preceding bales of another quality. This is prevented by ginning all one load of seed cotton before he begins to gin the next bale. Seed-roll density and other ginning elements should be uniform on all gin stands during the ginning of the bale. Seed rolls should be dumped periodically, to prevent accumulating foreign matter that may contaminate the bottom of a bale ginned from clean seed cotton.

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